FULL FORCE INTEGRATION

INTRODUCTION

Space systems are crucial to this nation's ability to wage war. Space-based systems for navigation, weather, meteorology, missile warning, ISR, and communications have become so powerful that no operational commander would consider fighting without them. But each sector evolved separately, so management of these systems is divided among a number of DoD, intelligence, civil and commercial organizations–each with a different approach to serving warfighters. This fragmenting of organizational responsibility keeps us from streamlining space support to our forces in the field. Full Force Integration (FFI) is USSPACECOM's strategy to seamlessly weave space capabilities into all dimensions of warfare. See Figure 7-1.

Full Force Integration means integrating space forces and space-derived information with their counterparts on land, sea, and air. If this integration is thorough enough, operational commanders can use space assets as intuitively as the more traditional ones.

Space forces consist of people, weapons, and systems (and their supporting infrastructure) that carry out USSPACECOM's missions. Space information is derived from systems that USSPACECOM controls and from those under the NRO, NASA, other governmental agencies, and commercial organizations.

To fully integrate space forces and information systems with land, sea, and air forces, USCINCSPACE must encourage some parallel efforts regarding policy, doctrine, people, information, and organizations.

- **Policy** must encourage further integration of commercial, civil, and allied space systems into joint warfighting. Examples are (1) defining the military's responsibility in protecting vital commercial assets in peace, crisis and war; (2) developing mobilization plans (Civil Reserve Air Fleet [CRAF] or other similar ideas) that ensure commercial services are available when needed; (3) defining or adjusting the warfighting roles of organizations like the NRO and National Oceanic and Atmospheric Administration; and (longer term) (4) weapons in space.

- **Doctrine** must ensure space operations fully integrate with other mediums of warfare. Two examples are (1) operational doctrine necessary for unit level forces to fully exploit information dominance; and (2) doctrine that tells us how to task and distribute space-based ISR in direct support of field operations. Each of these is being reevaluated and has yet to mature.

- **People**. Strengthen the emphasis on space at every level of education and training. Although space support is already essential to military operations, conventional warfighters don't always understand it.

- **Information**. As a global defense information network (and the doctrine and tactics for using it) evolves, space information, operations, and forces must be part of that network at every level, so commanders can use all of them in war.

- **Organization**. New organizational relationships and partnerships among the civil, military and commercial communities must develop if we are to integrate all systems into our military's use of space. USSPACECOM's recent partnerships with the NRO (to improve ISR support to warfighters) and NASA (to improve leading edge technologies) are significant steps in the right direction.

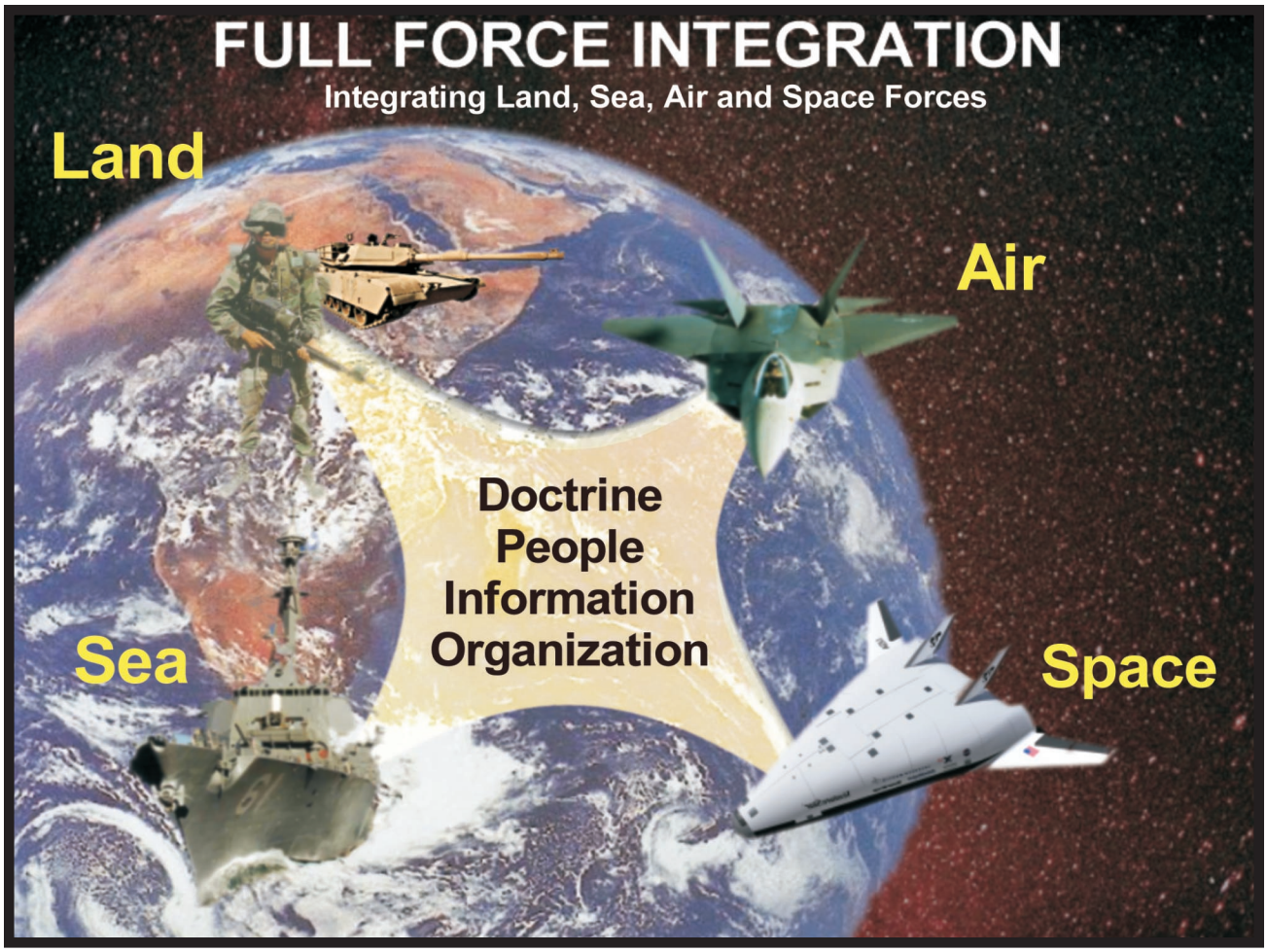

Figure 7-1 Elements of Full Force Integration

END STATE

In 2020, we see space forces completely integrated with land, sea, and air forces. Warfighters are trained to take full advantage of space capabilities in special, joint, and combined warfare. Should threats to our national security emerge and our civilian leadership decide, weapons in space could be deployed–first for national missile defense, then toward theater missile defense, and eventually for additional missions. Tactics, techniques, and procedures mature as a result of policies and doctrine that encourage employing capabilities from all mediums throughout the entire spectrum of conflict. USCINCSPACE ensures space is operationally integrated throughout DoD and directs warfighting in and from space. Global defense information network gives warfighters easy access to information from all sources plus high-speed direct downlinks to precision weapons and platforms. We've pictured this end state in Figure 7-2.

KEY OBJECTIVES

To achieve our goals, USSPACECOM addresses four key elements: policy and doctrine, people, information, and organization. As the following pages describe, we must lead or advocate changes and developments in each area.

Policy and Doctrine

National space policy provides the foundation and rationale for greater cooperation and focus in space programs (including funding and initiatives) across civil, commercial, intelligence and military organizations. We need clear strategies and policies to integrate military policy and doctrine across all mediums and throughout the full spectrum of conflict. Many implied elements of Full Force Integration link conceptually to those of Global Engagement and Control of Space. For example, to "negate" forces under Control of Space, we may need to use land, sea, and air forces to destroy a

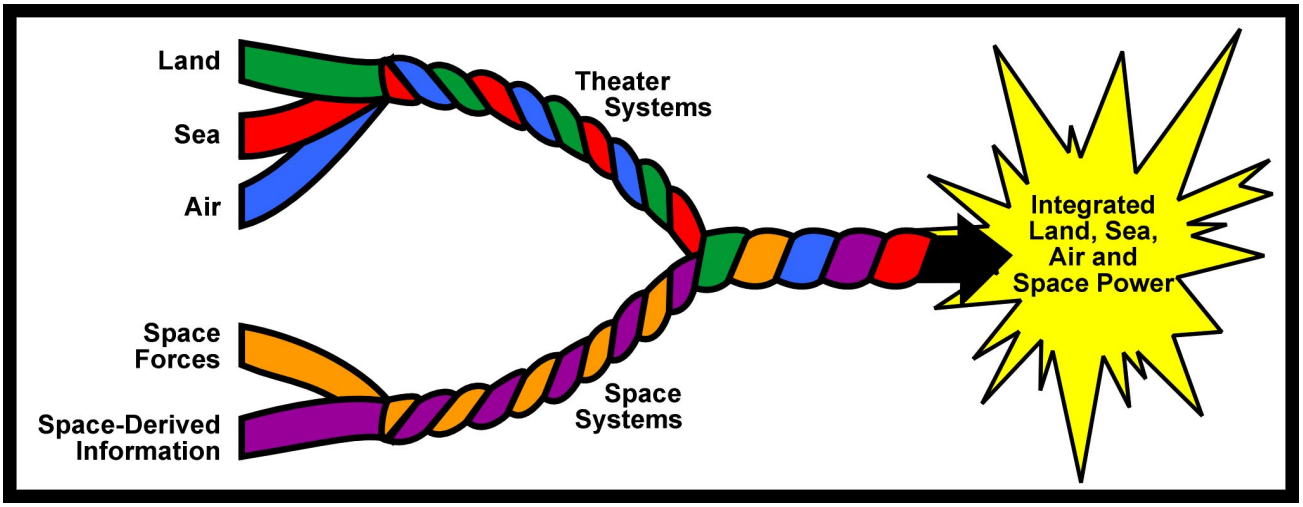

Figure 7-2 The Concept of Full Force Integration

hostile satellite's ground segment. But terrestrial forces may also need a space-based weapon to neutralize a terrestrial target. Thus critical milestones for Full Force Integration include selected policies, doctrine, and CONOPS from Global Engagement and Control of Space (see Figure 7-3).

Policy

Under the Unified Command Plan (UCP), USCINCSPACE is the single point of contact for military space operational matters. USCINCSPACE coordinates with the Joint Staff and appropriate CINCs to represent the military on space operations while working with national, commercial, and international agencies.

Agencies and governments will address major questions about space. They'll most likely move national policy toward better military control because potential adversaries will be able to use many commercial systems for military and commercial advantage. Decisions on whether to deploy National Missile Defense, develop antisatellite weapons, and allow weapons in space that can strike terrestrial targets will greatly affect future directions. Regardless of how these policies develop, the military's opinions will be important. Likely additional policies will (1) guide the US government's development of multilateral or bilateral agreements on surveillance and warning; (2) expand relations for command and control among CINCs who will use these weapons; (3) renegotiate the ABM or other treaties that new capabilities may affect; and (4) address how this nation will respond to attacks against our space assets.

A national space surveillance policy under development by the Deputy Under Secretary of Defense (Space) must address what space objects we should be able to detect and track, and what surveillance services the military must offer civil and commercial users. Because surveillance of space is a key enabler for controlling space, this policy is a starting point for future development of a more comprehensive policy as our ability to control space matures.

Force Enhancement missions (e.g., terrestrial surveillance and navigation) will migrate to space, and their space-based information will integrate further into an automated global information system. At that point, we'll need to develop a "global policy on sharing information" that will involve various civil, commercial, and military organizations. If US forces depend on foreign systems for space-based information, our policy must address what to do if these sources are denied for political reasons. This policy must detail how we'll use space information from sources other than the US government to ensure national security.

Doctrine

The employment doctrine in Joint Publication 3-14 is a starting point for integrating space-derived information and space warfighting with land, sea, and air forces. To fully integrate space forces with their land, sea, and air counterparts, we'll have to expand force application doctrine and build mature capabilities for force application.

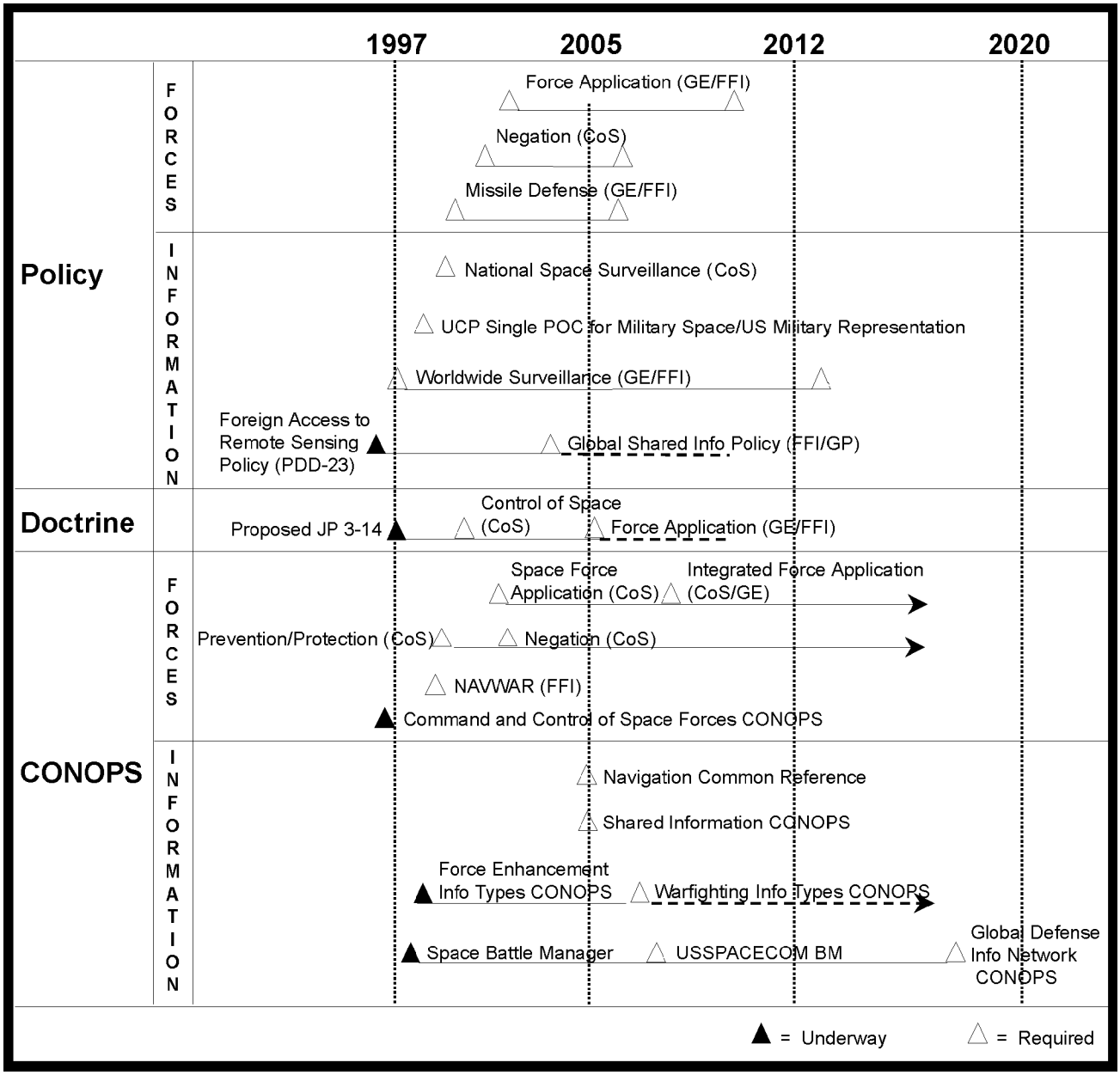

Figure 7-3 Roadmap for Policy, Doctrine and CONOPS under Full Force Integration

CONOPS

We'll need many CONOPS to expand the policies and doctrine for Global Engagement and Control of Space. Figure 7-3 depicts the ones we consider critical to Full Force Integration, such as the unique Navigation Warfare (NAVWAR) CONOPS, which must make up for losing selective availability (possibly as early as 2000). Another CONOPS will need to specify a common reference for navigation. As available information becomes more integrated, we'll need concepts to transform traditional categories for space-derived information (navigation, surveillance, warning, etc.) into categories of warfighting information (targeting, threat indications, geospatial, etc.). Other concepts will cover Protection, Prevention, and Negation (as part of Control of Space), as well as Force Application–employing and integrating those capabilities with forces from other mediums.

Assessing Policy and Doctrine

Changes to the UCP today recognize the need for a single point of contact for military space operations. The National Defense Panel's report, cited below, acknowledges the importance of guaranteeing a secure space environment.

"We will need to recognize that the US lead in space will not go unchallenged. We must coordinate the civil, commercial and national security aspects of space, as use of space is a major element of national power."

NDP Report, December 1997

The trend in these documents makes it clear that we'll see more policy and doctrine emphasizing space security, with momentum increasing as warfighters discover the importance of space.

Directives and Recommendations

USCINCSPACE will direct plans for the following doctrine and CONOPS.

- Control of Space Doctrine (SPJ3/5)
- Space Force Application CONOPS (SPJ3)
- Prevention/Protection and Negation CONOPS (SPJ3)
- Navigation Warfare CONOPS (SPJ3)
- Shared Information CONOPS (SPJ3/6)
- Force Enhancement Information Types CONOPS (SPJ3/6)
- Warfighter Information Types CONOPS (SPJ5/6)
- Space Battle Manager CONOPS (SPJ3/5)
- CONOPS for USSPACECOM Battle Managers (SPJ3/5)
- Navigation Common Reference CONOPS (SPJ3/5)
- Integrated Force Application CONOPS (SPJ3)

At the same time, USCINCSPACE should advocate the following policy, doctrine, and CONOPS at the national level.

- Missile Defense Policy (SPJ5, OSD Policy)
- Force Application Policy (SPJ5, OSD Policy)
- National Space Surveillance Policy (SPJ5, OSD Policy)
- Worldwide Surveillance Policy (SPJ5, OSD Policy)
- Global Shared Information Policy (SPJ5, OSD Policy)
- Force Application Doctrine (SPJ5, JS)
- Negation Policy (SPJ5, OSD Policy)
- Global Defense Information Network CONOPS (SPJ5, DISA)

People

"Every day, someone finds a way to compare with—even equal—our leading edge technologies. But the difference in our favor, in the end, lies in our people and their training. The training of our soldiers, sailors, Marines and airmen, along with the courage and information to command and control them well, is a decided advantage of our Forces. If we provide accurate and timely information to our trained warfighters, they will win. Without this, technology is of little worth."

VADM Lyle G. Bien, USN, Deputy USCINCSPACE, October 1997

As space forces become equal partners with land, sea, and air forces, warfighters must be confident and competent users of space capabilities and products. They must understand how space functions (communications, position/navigation, weather/terrain, warning, and reconnaissance/surveillance) affect warfighting functions (e.g., the Army's Battlefield Operating System, the Air Force's Core Competencies, and the Naval Expeditionary Force's Critical Operational Capabilities). USSPACECOM will contribute to this understanding of space by advocating space knowledge in professional military education and incorporating space into operational unit training across the force, ensuring space integration into field and command post exercises, and employing accurate models and simulations of space capabilities (Figure 7-4). At the same time, space warfighters will understand land, sea, and air operations through professional military education (PME) and assignment experience.

Educating the Force

The goal of USSPACECOM's effort in space education is to integrate space into the core curricula of PME to educate students on how space systems affect strategic, operational, and tactical warfighting. The command will do so by advocating space education to the Services and PME schools. As the UCP designated space advocate,

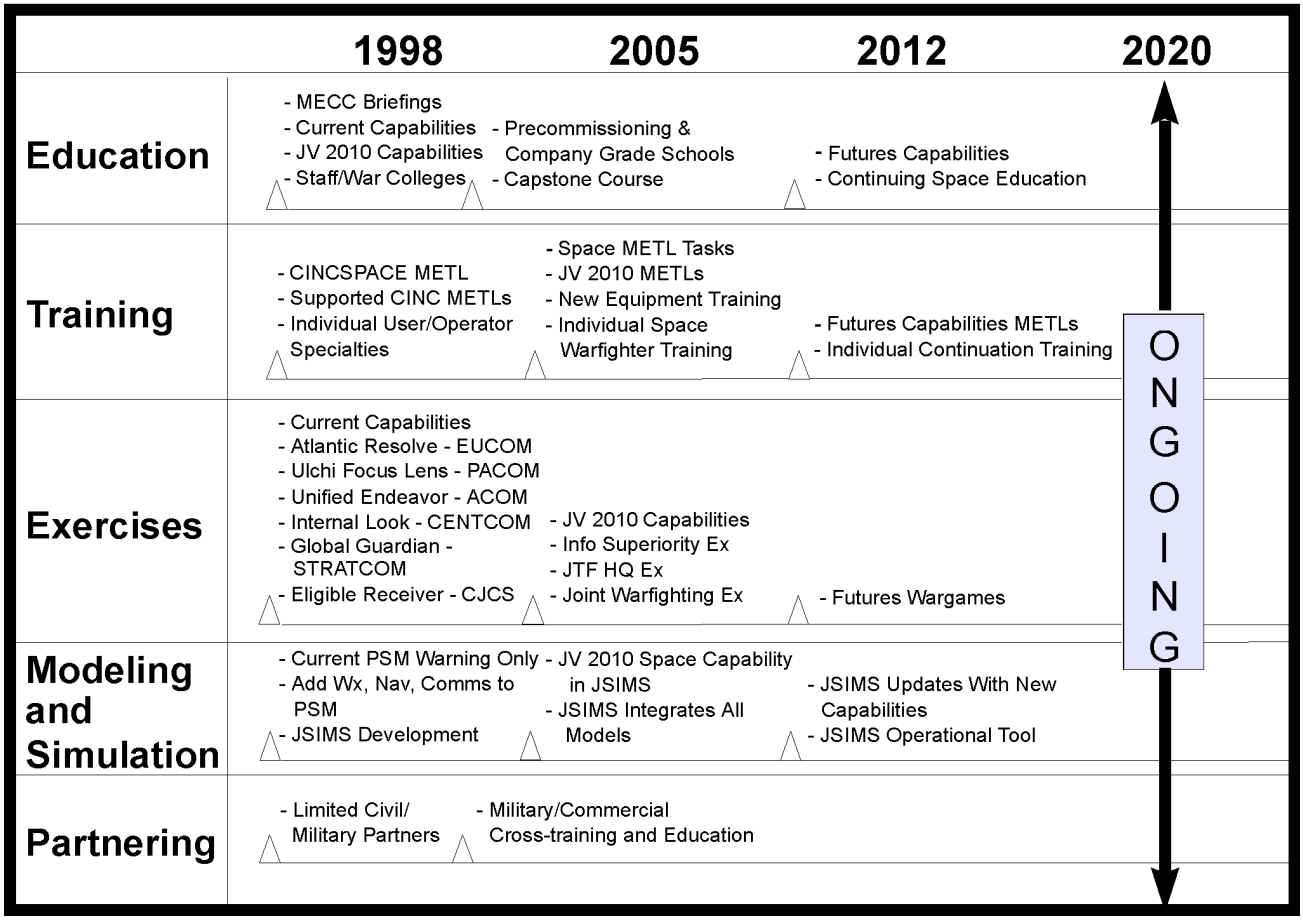

Figure 7-4 Roadmap for People

USSPACECOM should define requirements for space education: current space capabilities, limitations, and vulnerabilities; space systems' contributions to future warfighting (*Joint Vision 2010*); and the direct effect of space as a warfighting medium on defending the United States.

In 1998, space isn't well integrated into the PME curricula. Education for warfighters must focus on how space enhances warfighting, not on space theory (orbital mechanics, space environment, etc.). In 1997, USSPACECOM briefed these requirements to the Military Education Coordination Conference (MECC), consisting of the Commandants or Presidents of key military colleges and universities. Our aim was to formally integrate space into school curricula and get space designated as a special area of emphasis. To help do so, we're joining with the NRO to develop a common reference database, or space body of knowledge, to keep space information up to date. The objective is to integrate space into curricula of the senior service schools, staff colleges, and General Officer Capstone Course curricula by the summer of 1999. The schools include:

- National War College
- Industrial College of the Armed Forces
- Army War College
- Naval War College (both levels)
- Air War College
- Marine War College
- Armed Forces Staff College
- Army Command and General Staff College
- Air Command and Staff College
- Marine Corps Command and Staff College

By 2005, space will be in all professional military education, including:

- Precommissioning
- Officer Basic Courses
- Advanced Officer Courses
- Staff and Senior Colleges (listed above)
- Selected NCO and other enlisted schools

By 2012, all military-education programs will teach space as integral to *Joint Vision 2010's* warfighting

doctrine and as a key to Precision Engagement, Dominant Maneuver, Focused Logistics, and Full Dimensional Protection.

Training the Force

USSPACECOM must advocate integrating space into training at every level so warfighters can apply their knowledge of all space capabilities (national-level, military, and commercial) to their operational tasks. This classic concept–"train the way we fight"–means warfighters will have more space skills and, therefore, greater warfighting effectiveness. But this kind of training means Mission-Essential Tasks Lists (METLs) must incorporate space tasks. (METLs are baseline documents used to build unit training plans and exercises.) USSPACECOM must ensure all training events involve military (black and white) and commercial space assets.

USCINCSPACE's METL for 1997 includes tasks for each space mission area in the UCP. These tasks flow down to the METLs of USSPACECOM's Components, ending with individual training at service schools and space command units on how to operate space systems. The METLs of regional combatant commands don't include using space capabilities. Efforts are underway to transfer these tasks to the staffs of regional CINCs from Joint and Service Space Support Teams–a first step toward integrating space employment across the force.

As space becomes a vital area of national interest around 2005, USCINCSPACE's METL must change to include tasks for warfighting in space. Also as *Joint Vision 2010's* concepts integrate space, the METLs of other regional CINCs must include the appropriate tasks. Services and units that acquire space systems will train operators to use them.

By 2012, USSPACECOM and the regional CINCs will include unit training for future space systems in their METLs.

Incorporating Space in Field and Command-Post Exercises

Field and simulated exercises are key to training that requires units to do mission-essential tasks. USSPACECOM must ensure that space events and organizational relationships become part of exercise scenarios, so warfighters will gain experience and confidence in using space systems.

Major exercises must expand their use of space through 1999, with more space events in scenarios that flow from one exercise to another. USSPACECOM, along with regional CINCs, will focus on developing and participating in two to three major exercises each year. This schedule will allow detailed preparation and produce the most benefits.

By 2005, field and command post training will routinely include space concepts, with or without USSPACECOM's participation. Warfighters must synchronize space capabilities with other combat functions for best results, and Joint Staff exercises must continue integrating space into *Joint Vision 2010's* operational concepts. USCINCSPACE-sponsored wargames will exercise space as a warfighting medium.

As the total force trains and fights using *Joint Vision 2010* doctrine, they will exercise space as a full partner with land, sea, and air forces. Exercises that include support from space, operations in space, and space combat will train all forces.

Modeling and Simulation

Key to effective exercises are accurate space models and simulations that integrate seamlessly into higher-level models and exercises. They must accurately incorporate space capabilities (national, military, and commercial), so warfighters can plan for and use them properly.

The Portable Space Model integrates only warning against theater ballistic missiles into the Aggregate Level Simulation Protocol. We are trying to integrate modules for space-derived weather, communications, and navigation into this model to simulate space capabilities more accurately. The National Air and Space Warfare Model will start using the portable space model's capabilities around 2005, integrating all space mission areas into the architecture for Joint Simulation System. Further, advanced modeling and simulation of space capabilities will allow tradespace studies to improve decision making on acquisitions.

By 2012, as more space capabilities get into the field, analysts will update or develop simulation modules to ensure continued integration with the Joint Simulation System or future architectures. Services developing systems for space must provide corresponding models to make sure we continue to train the way we fight. Warfighting CINCs would have to approve exceptions to accurate, integrated models.

Establishing Partnerships for Education and Training

To take advantage of emerging developments in space, we need to consider partnering with private, public, and commercial sources of education–especially in areas where the DoD relies on commercial and other assets. We must also ensure allied and coalition partners understand how to apply space capabilities to warfighting and are trained to operate associated systems. Allies and coalition partners must also join us in training exercises and be able to access models and simulations that strengthen the use of space across the four warfighting mediums. International exchange students at US schools and combined exercises (e.g., Ulchi Focus Lens, Partnership for Peace) will give us excellent opportunities for this type of education and training.

Assessing People

The integration of space concepts into the four warfighting mediums through education, training, exercises, and modeling and simulation is achievable. As space capabilities are integrated across the force, warfighters must understand the impact of space. By 2012, space will be fully integrated into education, training, exercises, models, and simulations with allowances for updates as new systems come on line.

Directives and Recommendations for Education and Training

USSPACECOM and its Components will **direct** four main actions for educating and training warfighters on space:

- Develop and advocate operational requirements for space education, training exercises, and modeling and simulation. (SPJ3)
- Help develop curricula and educate instructors for joint and service PME. (SPJ3)
- Develop METLs for space forces and help regional CINCs with their METLs. (SPJ3)
- Help regional CINCs develop exercises and participate in those exercises. (SPJ3)

In addition, USSPACECOM strongly **recommends** that:

- Services and PME schools integrate space into core curricula. (Services, JSJ7, Schools)
- Regional CINCs include space tasks in their METLs and exercises. (Regional CINCs)
- Services train on how to operate space systems. (Regional CINCs)
- All new models and simulations include space capabilities. (Services)

Information

The US military forces are in the early stages of an information revolution. Warfighters can access amounts of information previously thought impossible to deliver and manage. We can bring much more information to the battlefield in near real time, but because many organizations manage this information, it's largely stovepiped, often inaccessible, and poorly fused, and it doesn't transfer well among systems.

Emerging trends in information management and developing technology (especially commercial) suggest the directions future architectures will take. The DoD's space systems must stay in step with these directions if we are to achieve Full Force Integration. Key technologies and developments include:

- **Bandwidth**. In the next 20 years, we believe the lack of on-demand bandwidth will cease to be the major limitation it is today. Microwave, fiber-optic and satellite communications networks (military and commercial) are growing at an amazing rate and will support entirely new concepts of distribution. These systems will improve our ability to access bandwidth-on-demand.

- **Satellite communications**. A dramatic story that's stimulated mostly by commercial demands. Satellite communications–from traditional geosynchronous to low or medium earth orbits–will make it possible to bring unprecedented volumes of information to mobile forces.

- **Web technologies**. Internet technologies are changing information systems. Internet-led

developments make it possible for operators at every level to extract focused and relevant information out of ever expanding databases–and to sort intelligently and flexibly through an enormous flow of sensor reports in near real time.

- **Fusion**. Breakthroughs in information-fusion techniques will make it possible to more easily turn previously disconnected bits of information into real-time knowledge on the battlefield.
- **Cataloging.** Intelligently managing the large volumes of information available to the warfighter is key to gaining information superiority. Correctly categorizing or labeling types of information will speed the dissemination of the right information to the right people.
- **Cross Cueing.** Sensors which cue or alert other sensors to focus in a particular area or medium will improve the probability of collection, precision, and integrity of the data. The correlation of data from multiple sensors about the same subject is key to providing the most accurate possible information to the warfighter.
- **Dissemination**. The intelligent distribution of information coupled with greater capacity and improved communications technology will provide the warfighter more timely and reliable information.
- **Multilevel security**. This ability will make possible fusing information from all classification levels into a single operational picture.

These developments combine to make virtually all information (whether near real time or in extended databases) available to warfighters. A global defense information network accessible by any level of command through a "battle manager," is one way to visualize the information future. Figures 7-5 and 7-6 try to capture the contrast between present and future military information systems.

To integrate space-derived information with that from land, sea, and air, USSPACECOM must (1) develop battle managers to handle USSPACECOM's missions; (2) adopt common standards to enable interoperability for systems USSPACECOM and its components own; (3) advocate these standards to external owners of space systems; and (4) determine common types of "warfighter information," so warfighters get space information in readily useable formats.

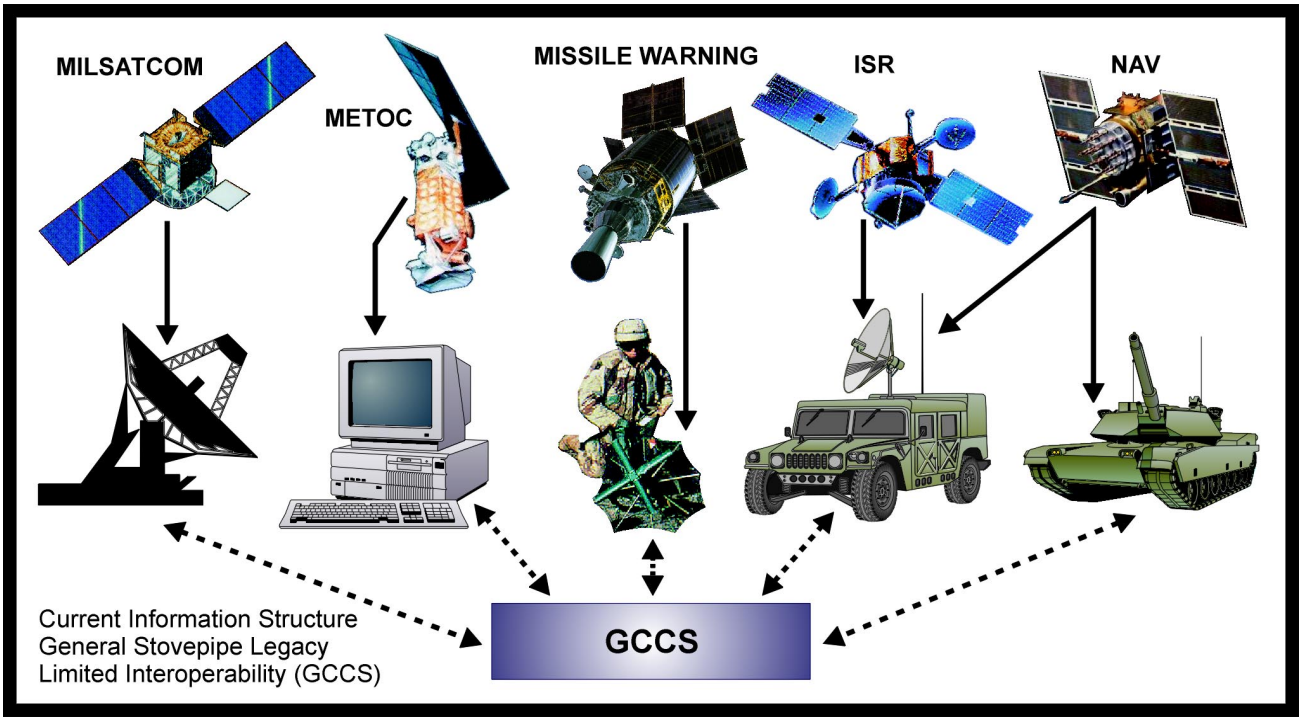

Figure 7-5 Current Information Structure

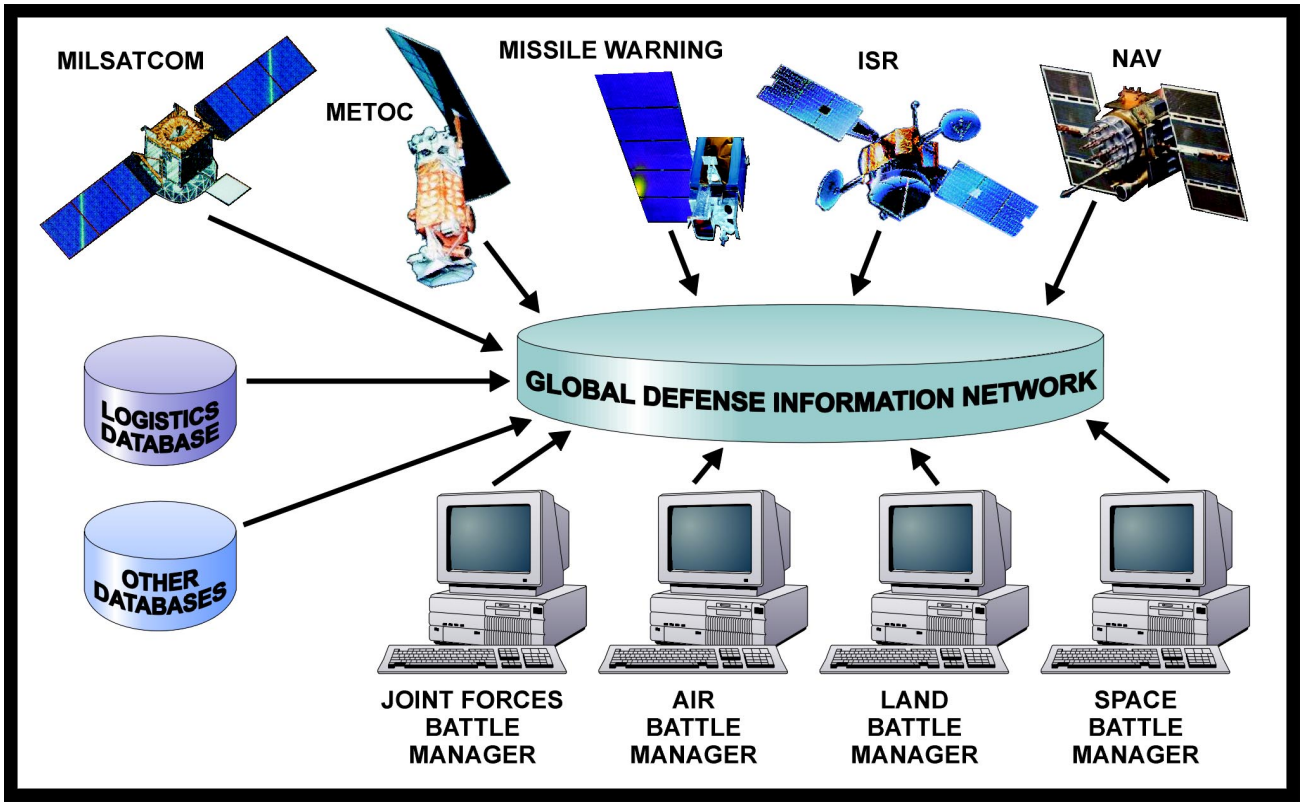

Figure 7-6 Future Information Structure

Developing Battle Managers for USSPACECOM

Battle managers are local, automated systems for managing information. They consist of hardware, software, and databases that depend on the global grid for connectivity. USSPACECOM and its components will develop battle managers tailored to satisfy space missions. We're referring to all battle managers for space missions as USSPACECOM Battle Managers. We expect these battle managers to include missions under such operational concepts as Global Engagement and Control of Space. They'll also support decision makers at the CINC, Component, and Joint Task Force levels. These battle managers will integrate fully with each other (see Figure 7-7).

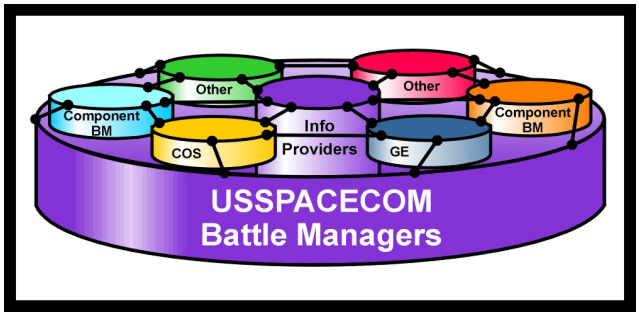

Figure 7-7 USSPACECOM Battle Managers

USSPACECOM's Battle Managers evolve from N/UWSS and the Space Operations Center's Space Battle Manager. They develop according to the timelines in Figure 7-8.

Among other functions, USSPACECOM's Battle Managers may need to fuse information for, and/or support:

- **Status of own forces**. This informs commanders about the location, readiness, support status, activities, and intentions of subordinate forces. In most cases, our own units report this information. USSPACECOM's Battle Managers would include information about constellations, launch ranges, control networks, and, eventually, weapons.

- **Status of hostile forces**. This information usually comes from ISR systems and covers the same areas as for our own forces. In space, this would mean information about the enemy's space assets and threats to friendly space forces.

- **Status of the environment**. This information includes weather, oceanography, mapping, charting, and all other information commanders would need about the battlespace environment.

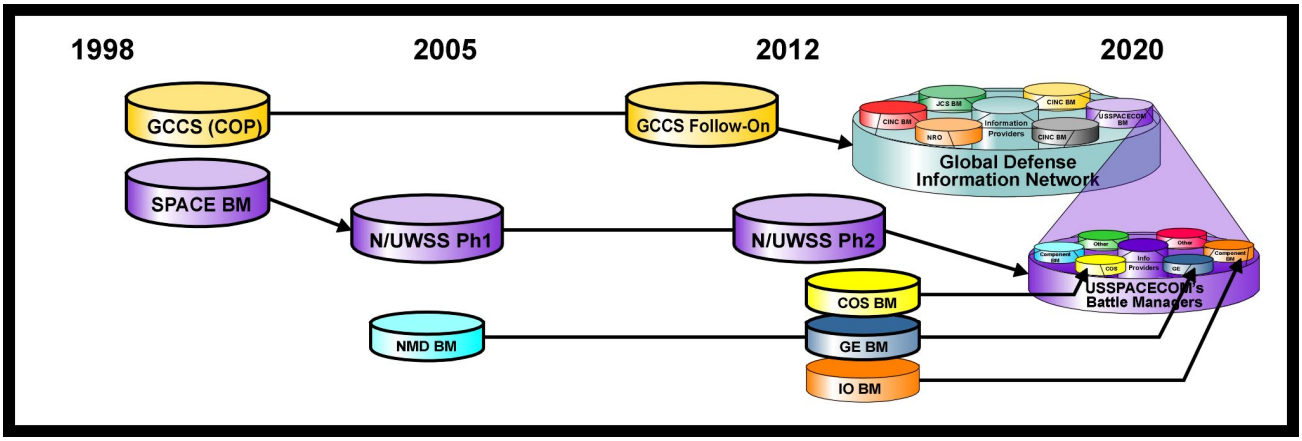

Figure 7-8 Development of USSPACECOM Battle Managers

- **Command and control**. Battle managers would process collaborative plans, commanders' intentions, directions, priorities, and other elements of command and control. For space, this would include actively defending our assets, managing surge launches, command and control of space-based weapons, tailoring constellations to tactical situations, and handling issues for command and control.

- **Information fusion**. Although fusing is improving as more intelligent algorithms emerge, the fused data will become highly distributed. USSPACECOM's Battle Managers may overcome this dispersion by fusing information to build a space picture and making that fused product available to all interested users of the global grid.

- **Decision Support**. Decision support demands ever more sophisticated approaches. It includes techniques such as advanced systems to display information, battlefield video conferences to improve collaborative planning, and using modeling and simulation in real time to examine alternative courses of action. USSPACECOM's Battle Managers would host much of the decision support for space.

- **Information sharing**. No commander fights alone on a modern battlefield. The battle managers of individual commanders also develop a common picture among peer and senior commanders. For example, as USCINCSPACE uses USSPACECOM's Battle Managers for command and control, interoperability among systems and information will allow information sharing, giving the Joint Forces Commander, as well as the Component Commanders for land, sea, and air, complete insight into the status of space forces.

- **Tasking**. Archived data may not satisfy some requests for information, so commanders may need new information. Interoperating battle managers will automatically task sources to capture the data or will recommend sources to commanders.

- **Modeling and Simulation**. Battle managers will offer state-of-the-art models and simulations that accurately represent all of USSPACECOM's missions to support decision making, exercises, and training.

- **Dynamic planning and execution**. Commanders and units need to react rapidly to changing situations in the battlespace and redirect actions. Battle managers would use models and simulations to manipulate resource details in real time and generate "what if" situations that support replanning. Then, when a plan is firm, a battle manager will generate the right orders to carry out new actions.

USSPACECOM's Battle Managers will process, cross cue, fuse, and rapidly disseminate information so warfighters can respond more effectively to changing circumstances in peace, crises, and war.

As stated above, no commander fights alone on a modern battlefield. USSPACECOM will ensure its battle managers are fully interoperable to provide products to, or receive products from, other CINCs' battle managers. A global defense information network (Figure 7-9) will allow battle managers to work together. This network–possibly a future version of the current Defense Information Infrastructure–will support combat operations at all echelons and through all chains of command. Battle managers will be key enablers of network centric warfare.

The name "global defense information network" was selected to avoid confusion with current terms. A network structure of this type makes possible a robust, interoperable system of battle managers. Without it, USSPACECOM's Battle Managers must stand alone. The Global Command and Control System and Global Combat Support System are operational precursors to this envisioned architecture.

Establishing Global Standards

USSPACECOM must meet the DoD's standards in developing its battle managers to make sure they'll integrate with others. Further, all of USSPACECOM's information-producing assets must meet these standards so all battle managers can easily process information from all sources. The command will follow the DoD's standards (or commercial standards) whenever they're practical, establishing unique standards only when these standards are clearly inadequate.

Determining Common Types of Warfighter Information

To give warfighters information superiority, data from land, sea, air, and space must be fully integrated, easily understood, and accessible. Today, most warfighters think of information from space as part of USSPACECOM's Force Enhancement missions, (warning, navigation, meteorological and oceanographic (METOC), earth resource monitoring (ERM), and reconnaissance and surveillance). Warfighters extract what they can and combine it with information from sources on land, sea, and air. To be fully supportive, this integration must be automatic, so we propose two key steps:

- **Get the right information to the right person**. Continue to improve the quality, reliability, and timeliness of information derived from USSPACECOM's Force Enhancement areas.
- **Use common terms**. Simplify the problem of integrating USSPACECOM information by using common types of "warfighter information."

In this section, we've focused on integrating information from space into all warfare mediums. Because Force Enhancement information is critical to warfighters, we must address USSPACECOM's capabilities, 2020 goals, and possible shortfalls for Navigation, METOC/ERM, Warning, and Reconnaissance and Surveillance.

Navigation

Space-based navigation systems provide three-dimensional position, data and a timing standard

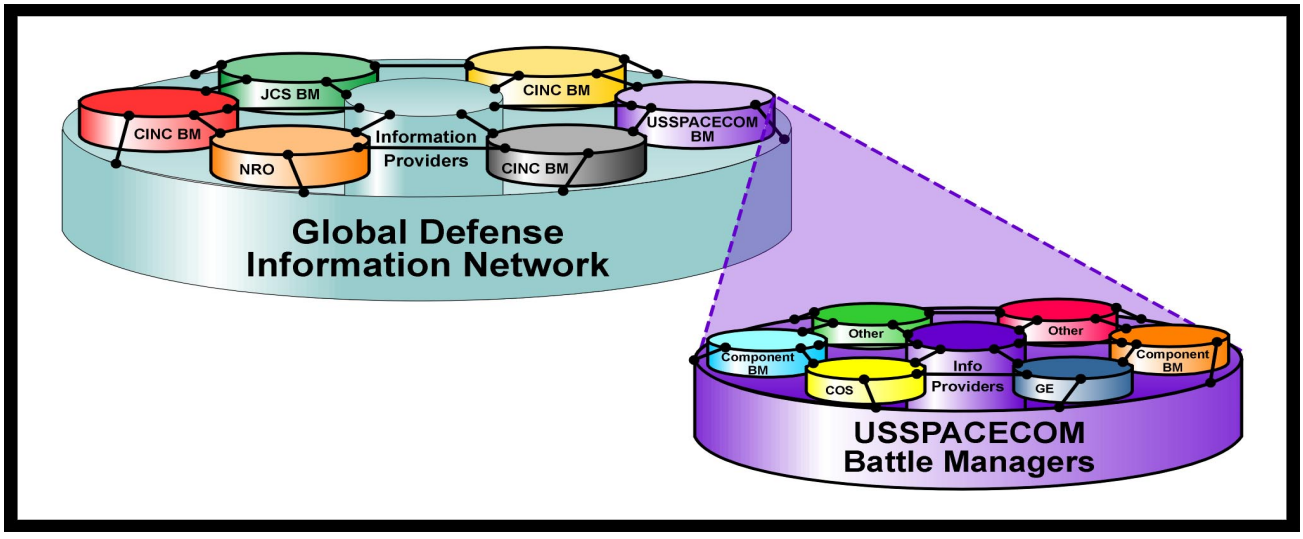

Figure 7-9 The Global Defense Information Network is Central to Battle Management (BM)

to military, civil, and commercial users worldwide. Precision navigation and timing are critical to coordinated and accurate force application by any platform in any medium providing, at a minimum, targeting and geolocation types of information. Space-based navigation into 2020 must be able to (1) cover the globe continuously in all environments; (2) cover space continuously; (3) improve positional accuracy; (4) improve timing accuracy; (5) operate in a navigation warfare environment; and (6) provide timely warning of failures.

Navigation systems now provide nearly worldwide coverage within the atmosphere at or above the earth's surface. With modest improvements already planned for the GPS constellation by 2020, this capability should reach 100% in all areas. But nothing on line or planned will support covert operations and some subsurface operations. We must explore technology to get coverage in all environments (e.g., through foliage and land structures). This technology must include the ability to adjust signals, power, and frequencies. For example, better technology for receivers, waveforms, and antennas could produce better penetration by the navigation signal for some applications.

Navigation positioning and timing are very important to space surveillance. It's now common for space vehicles to use navigation signals to determine orbits, calculate ephemeris data, and precisely time operations. By 2020, we'll need coverage in space out to geosynchronous orbits around Earth and beyond. Adding aft-facing antennas on GPS satellites will make this coverage possible by 2012.

Positional accuracy for systems using navigation and timing signals will improve spherical error probability (SEP) to less than one meter without relying on differential correction. Policy must address access to this precise locating data by nonmilitary users. Before 2020, other technologies, such as Wide Area Augmentation System or Local-Area Augmentation Systems, could enable instrument landing systems that can land vehicles at zero ceiling and zero visibility.

The accuracy of a satellite's timing signal is expected to improve to one nanosecond by 2020. Precision timing already synchronizes systems such as secure communications, but increasingly complex communications networks will demand an improved timing signal. Some future timing improvements will come from cross-linking designed systems that allow satellites to compare and null faulty data in positioning and timing. Clock technology will improve timing by allowing integration of navigation packages onboard the US host satellites, thus providing a larger constellation for timing references.

The relatively new concept of Navigation Warfare assures access to precise navigation information in a challenged environment. It also selectively denies this information to adversaries while lessening the effect on neutral or friendly operations. As CONOPS develop, they must make sure US and allied systems can work together. We expect future capabilities to include a separate military frequency and variable power, which will assure some access in a hostile environment. We need better signal penetration and anti-jamming.

Whenever a platform must navigate precisely, such as for aviation and movement in space, systems must be able to warn us about degraded performance, failures, and the ensuing effects. Notice of individual failures among satellites and user equipment must be fully automatic to be reliable and efficient. This requirement will depend mostly on software that allows users to receive status reports continuously. Figure 7-10 depicts navigation goals for 2020.

Meteorological and Oceanographic/Earth Resource Monitoring (METOC/ERM)

The DoD requires worldwide and regional sensing of conditions in the atmosphere and oceans, on land, and in space to support military planning and employment across all conflicts. From precision-guided munitions to amphibious operations to space launch, this monitoring gathers information for targeting, determining threats, logistics, the battlefield environment, and situational awareness. All warfighters require some degree of worldwide surveillance (see chapter 5, Control of Space). To meet our 2020 goals for warfighting, we must improve characterizing the environment in three dimensions (3-D), coverage, refresh rates (expediency), accuracy, and physical description.

Capabilities/Tasks	1998	2005	2012	2020
Continuous Global Coverage				
Subsurface	0%			Limited High Interest
Surface	90%			100%
Air	~100%			100%
Continuous Space Coverage				
LEO	~100%			100%
MEO	~10%		50%	100%
GEO x 2	0%		50%	100%
Improved Positional Accuracy	10 m SEP			<1 m SEP
Improved Timing Accuracy	8 ns			1 ns
Navigation Warfare (NAVWAR)				
Assure Access (Protect)	~25%		50%	100%
Selective Denial (Prevent)	Limited Tactical			Within AOR
Minimize Non-Adversarial Impact	None			No Impact
Interoperable with Allies	None			Full
Timely Failure Warning				
Signal	Manual Warning			Fully Automated
Receive Equipment	Minimal Feedback			NRT Feedback to Precision Users

Figure 7-10 Navigation Capabilities and Goals for 2020

Characterizing in 3-D precisely locates environmental conditions using north/south and east/west coordinates, plus altitude, anywhere on the earth's surface and in the atmosphere. At present, characterizing takes hours for environmental conditions and days for land areas. Our 2020 goal is to characterize any area on the globe in 3-D within minutes or hours and to overlay this information on the common operating picture. Faster processing and more sophisticated models are necessary to tailor products that meet the warfighters' requirements in near real time. Space sensors have limited ocean penetrating capabilities but adequately provide for peacetime needs.

To exploit trends in battlespace environments, systems must revisit and observe certain regions on Earth with a particular frequency (refresh rate). Now, we can refresh worldwide data for meteorology in hours and earth resources in days. For 2020, we want the former to be at 10 minutes or less because this type of information is so perishable. Information on earth resources can refresh more slowly because it doesn't change as often. Dramatic increases in the number of space-based sensors will meet all future goals for this area.

We also need better spatial resolution from our sensors. That means better ability to detail a specified area's atmospheric and terrestrial attributes. We now have depictions for meteorology to within a kilometer and for earth resources to within 5-30 meters. To support global strikes from space, we need the former to be within hundreds of meters and the latter to be less than a meter. But space-based sensors or technologies for these accuracies aren't in the pipeline, so we'll need new development to achieve 2020 goals for spatial resolution. These goals also require much better modeling and processing to produce data that warfighters can use in 2020.

Sensors that monitor earth resources can determine an area's physical characteristics. By analyzing the data from different spectral bands, we can, for example, discern manufactured objects from natural ones, classify what an object is, and determine how that object may be changing through interaction with gases or other substances. The more bands of spectral data available, the better we can define physical characteristics. Sensors now provide tens of bands, but warfighting in 2020 will require thousands. To get there, we believe

we'll need sensors providing ultra-spectral imagery which presently aren't funded or planned. But planning and funding are in place for several space-based technologies that will give us hyperspectral imagery (hundreds of bands).

To meet overall 2020 goals for METOC/ERM, we must use the many sensors (DoD and commercial) we expect to appear in space. Figure 7-11 depicts METOC/ERM capabilities and goals for 2020.

Warning

USSPACECOM needs warning information from space assets to defend against threats from land, sea, air, and space. Now and in the future, we must (1) be able to detect, track, and identify ballistic missiles, cruise missiles, and objects on land, sea, air, and space worldwide; (2) have survivable sensors; and (3) be able to generate and distribute warning information. Warning information supports warfighters requirements for worldwide surveillance, targeting, threat indication and geolocation. The ability to sense and distribute accurate, timely, and unambiguous warning information is critical to the full dimensional protection of our forces. See Figure 7-12 for a schematic of these capabilities.

The main warning goal in USSPACECOM's Vision for 2020 is to provide global coverage of threats to US interests. Because missiles and weapons of mass destruction (WMD) are proliferating among nations and non-nation states, we must be able to detect, track, and identify cruise missiles and other objects in all mediums worldwide. Warning must also expand to include high-interest relocatable threats. Systems now can cover some of the current ballistic missile threats. Many future systems will strongly enhance warning coverage for some targets worldwide but no plan is yet in place to cover all of them.

Warning systems in 2020 should be able to locate targets within less than a meter. Improved warning capability will enable us to more accurately determine launch positions and predicted points of impact of ballistic missiles; discriminate between reentering warheads and decoys; and discriminate among fixed, relocatable, mobile, and moving targets. This information can also be used in targeting (e.g., retaliatory force application against launch sites, mobile or otherwise). Limited capability to precisely locate targets depends on the cumulative capabilities of planned systems which we expect to be in the field by 2006. A robust capability will require a Space-Based Radar. Similarly, we'll need ultra-spectral imagery to precisely identify objects. The cumulative capabilities of planned systems will give us only limited coverage.

Capabilities/Tasks	1998	2005	2012	2020
Three Dimensional Characterization of				
Ocean Areas	Hours			Minutes
Land Areas	Weeks		Days	Hours
Atmosphere	Hours			Minutes
Coverage				
Earth METOC	Global			Global
Earth ERM	Global			Global
Refresh of Data Set				
Earth METOC	Hours			10 Minutes or Less
Earth ERM	17 Days	7 Days	72 Hours	6 Hours or Less
Spatial Resolution				
Earth METOC	Kilometers		500 Meters	Meters/ 100s of Meters*
Earth ERM	5-30 Meters			Sub Meter
ERM Spectral Resolution	10s of Bands	100s of Bands		1000s of Bands

*Meters requirement for Force Application, 100s of meters will satisfy METOC.

Figure 7-11 METOC/ERM Rolled-Up Capabilities and Goals for 2020

Capabilities/Tasks	1998	2005	2012	2020
Detect/Track/Identify				
Coverage (Ballistic Missiles)	AOIs			Global
Coverage (Cruise Missiles/Others)	<10%		50%	Global
Precise Geolocations	10 Km	Meters		Sub Meter
Object Type	Limited Set			All Objects of Interest
Timely Detect & Identify	Minutes			NRT
Survivability	Limited			All Levels of Conflicts
Generate Warning Information	Manual Voice/Limited Auto/Minutes			Fully Automated NRT

Figure 7-12 Warning Capabilities and Goals for 2020

We have to detect and identify potential threats in near real time because theater missiles have short flight times, adversaries have better precision-strike weapons, and weapons of mass destruction are proliferating. We'll need object typing to help identify all objects of interest, including the type of warhead. Automatic cross-cueing, better processing and algorithms, and auto-recognition technologies are critical to timely detection. But no one is considering placing these technologies in warning systems, even though manual processing won't support the 2020 need.

Warning systems must also survive all levels of conflict and warfighting environments while quickly, reliably, comprehensively, and unambiguously warning about and characterizing all threats. Effective strategies for survivability and hardening also reduce life cycle costs by increasing a satellite's operability and endurance. Current space systems, as well as communications links to and from these space systems, meet survivability requirements. But ground-based segments fall short. According to analysis, near-term actions should keep warning systems survivable against most threats but will offer only limited protection against chemical and biological attacks.

By 2020, commanders will require warning information in near real time because of short flight time of theater missiles and improved capabilities of other weapons. To meet these requirements, warning messages must be generated nearly simultaneously with the warning indication and be continuously updated so they're always current and ready for release. Existing or planned command and control systems will distribute this warning information.

Reconnaissance and Surveillance

Reconnaissance and surveillance are essential to the warfighter. Worldwide surveillance is critical to developing situational awareness of the battlespace. Although we'll limit our discussion here because much information is classified, these abilities are vital to warning, threat indications, targeting, geolocation, and virtually every other type of warfighter information.

The US sensor capabilities are currently without peer. New and improved technologies including Hyper-Spectral Imagery (HSI), Ultra-Spectral Imagery (USI), Advanced Electro-Optical Warning Sensor (AEOWS), Space-Based Radar (SBR), and developing Low Observable (LO) and Moving Target Indicator (MTI) will come on line over the next few years to meet detection, coverage, target characterization and geolocation accuracy requirements envisioned for 2020. A shortfall exists, however, in the areas of tasking, cross-cueing, fusion, processing, and dissemination of intelligence data.

[*Note:* The roadmap for reconnaissance and surveillance is classified.]

Candidate Types

The categories and roadmaps we've described for space information are based on decades of experience in supporting warfighters' missions from space. USSPACECOM is confident this planning

captures most future requirements for space derived information. But creating types of warfighter information–repackaging it into categories consistent with warfighters' needs–offers several advantages.

- **Timeliness**. Automated battle managers with advanced ability to fuse data will offer high quality information in near real time.

- **Fused and Correlated Information**. This information will increase a warfighter's situational awareness with a more complete, and possibly more accurate, picture of the battlefield.

- **Joint Interoperability**. Common terms improve joint operations by allowing automated systems, warfighters, and developers to understand each other.

- **Acquisition Tradeoffs**. Defining requirements in terms consistent with joint warfighting doctrine will help us compare information-producing systems across the land, sea, air, and space mediums. As a result, joint warfighters can more effectively lead the allocation, assessment, and acceptance of Service provided capabilities. If done right, these terms will sharply reduce redundancies and guide investments in an effective fighting force.

While "warfighter information types" that best support USSPACECOM's warfighter requirements are not decided, some likely candidates are:

- **Targeting**. Urban warfare, limits on collateral damage, and other reasons for surgical strikes call for ever more precise targeting information. For characterizing and geolocating targets, especially mobile ones, warfighters will likely require sub-meter accuracy in near real time. Space-based warning, reconnaissance, surveillance, and ERM can contribute to this information.

- **Threat indications**. This includes such factors as determining the status of hostile forces, detecting missile launches, and identifying and tracking threat objects. Attaining and maintaining battlespace awareness, so commanders can operate within an adversary's decision cycle, means continuously covering the battlespace and delivering information to the warfighter in real time or near real time.

- **Geospatial**. This type of information enables warfighters to determine accurately an object's location on earth, in the air, or in space. Geospatial information is critical to building situational awareness, planning, and completing missions. It also supports other information types, such as targeting and threat indications. Its main source is navigation systems.

- **Analysis and Assessment**. For commanders to develop accurate situation awareness, they must analyze and assess such things as the environment, terrain, status of hostile forces, tactics, effectiveness of friendly or enemy forces (including bomb damage) and social, economic, and political climates. Space-based reconnaissance, surveillance, and ERM contribute to this information type.

- **Environment**. Information such as weather (both terrestrial and in space), nature of the terrain, currents, and tides are critical to military operations, from battle planning and execution, to logistics. Space assets for meteorology provide most of this type of information.

Partnerships

Commercial technology already exceeds some of DoD's capabilities and will continue to outpace them. Thus, DoD should develop partnerships to exploit artificial intelligence for use in battle managers and the global defense information network, as well as to develop spectral imagery, increase data processing speed, fuse data, and observe the atmosphere and oceans. These partnerships will save money while maintaining the "leading edge" for our space forces.

Assessing Warfighter Information

By 2020, we can achieve the following:

- Provide standardized, interoperable information from space-based assets.
- Build battle managers that will give USSPACECOM's commanders global situational awareness, tools for deliberate and crisis

planning, support for developing operations concepts, force execution paths, real-time and post-mission assessment, and robust command and control.
- Format data into common types of warfighter information for use in battle managers.

GCCS and GCSS are operational precursors to USSPACECOM Battle Managers. The trend toward using global standards in the DoD is gaining strength, and most technologies for global defense information network are in place or under development. We anticipate that required technologies will get more attention because commercial groups also are interested in them. The real challenge is ensuring producers of space-derived information continually evaluate their contributions to the common information types, so warfighters will get the best possible support.

Directives and Recommendations on Information

This LRP **directs** three key actions for USSPACECOM:
- Develop USSPACECOM Battle Managers that are interoperable with each other to handle the command's missions. (SPJ3/5/6)
- Adopt or create global standards for USSPACECOM's information and information-producing systems so they can easily integrate with other warfighting mediums (land, sea, and air). (SPJ6)
- Evaluate warfighter information types to enable USSPACECOM to provide more readily usable information to warfighters, help integrate information among space systems, and improve acquisition of systems. (SPJ5/6)

This plan **recommends** that USSPACECOM:
- Promote acceptance and use of common (joint) standards for all producers of military space information. (SPJ6, Joint Staff)

Organization

The Department of Defense (DoD) has successfully developed the military's abilities in space through diverse organizations with strong skills in specialized areas. Although technically proficient, these organizations focus on their own expertise and don't interact much. No organization is the focal point or coordinator for this community. A fragmented space community hinders the warfighters' best use of space capabilities.

To remedy this situation, the military, intelligence, and civil space communities must reevaluate the way they task and operate, must close the gap between black and white space operations; and, must build partnerships to better support warfighters. Recognizing this need, the Unified Command Plan designates USSPACECOM as the single point of contact for military operational matters in space including communications. But we can't achieve a cohesive space community merely by naming a single point of contact. Instead, we need a comprehensive approach in three areas: (1) how warfighters request space-derived information and the way we task space resources; (2) the structure necessary to support all warfighters' space needs and to command, control, and carry out space missions; and (3) the partnerships needed to encourage cooperation throughout the community.

Figure 7-13 provides an overview of how processes, structures, and partnerships evolve toward a global defense information network enabling warfighters to directly request, task, and access resources from the military, intelligence, and civil space communities. Meanwhile, USSPACECOM must lead the effort to meet warfighters' requirements.

Organizational Process

A variety of space and non-space systems are available to collect information. The processes to request and task **space** resources are too complex, time consuming, and cumbersome. Today, most information providers require users to follow their unique "request for information" procedures. Even agencies and other military organizations that operate in the same area don't combine or standardize their processes. Request formats, priorities, and product formats all vary. Furthermore, tasking often requires someone to determine priorities. Requesting and tasking must be streamlined to give warfighters simpler, faster access to space-derived information.

To improve requesting and tasking, the Joint Staff, space, communication, and intelligence communities must join forces to standardize the way they plan, set priorities, task, carryout warfighters'

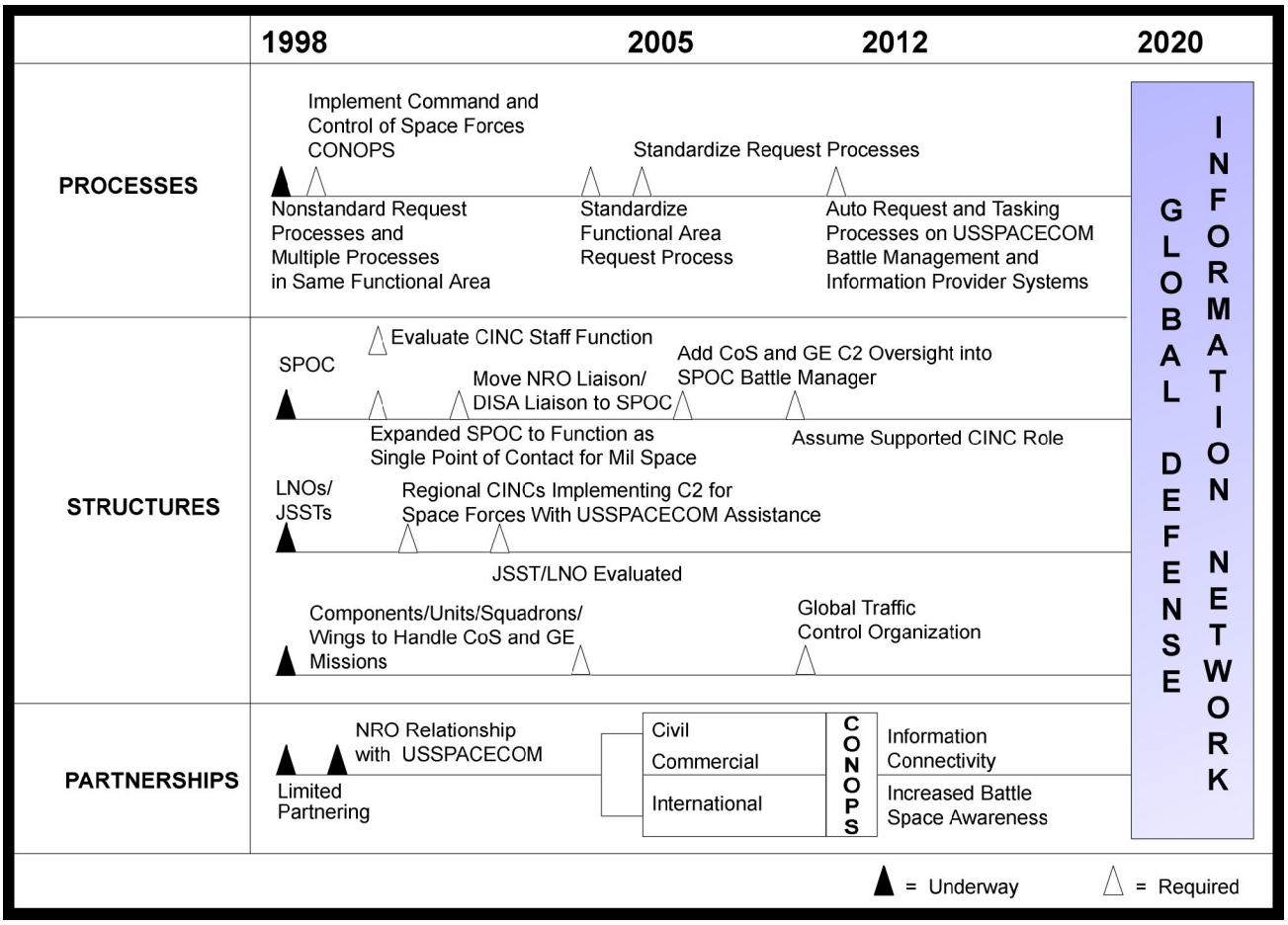

Figure 7-13 Overview of Processes, Structures and Partnerships

requests, and report on the status of space systems. Standard processes don't mean the information providers lose control of their products or resources, nor do they prevent warfighters from working directly with their information providers. Normal decision making to resolve apportionment issues won't change. The goal is to provide warfighters standardized request formats, priorities, and product formats that are simple to use no matter who provides the information.

The first step is to ensure functional areas (i.e., MILSATCOM and intelligence) have standardized procedures through which warfighters can readily request space support. As an example, two warfighters requiring different MILSATCOM support–say, ultra-high frequency and the Defense Satellite Communications System–will follow the same procedures for both.

Once functional areas have standard processes, we can integrate them across the space community. Then, automating these procedures will give the warfighter one uniform process for information requests.

At the same time, we must examine how tasking occurs and improve it, possibly using USSPACECOM's concept of operations for Command and Control of space forces. This concept would standardize space tasking and give warfighters a single point of contact, so they can integrate planning and synchronize assigned space forces.

We imagine the military, intelligence and civil space communitites, as well as the warfighting CINCs, will incorporate these automated processes into their battle management and information systems to facillitate real time information and battlespace characterization.

A good model is the planned tasking for the Space Based Infrared System (SBIRS). It shows the flexibility we need in future systems. Situations and priorities drive its automated processing from customer to sensor in real time. Priorities across

different mission areas (missile warning and defense, technical intelligence, and battlespace information) will go into a database that will automatically order support requests without the delays in current processes that have people in the loop. The result will be more responsive and direct support to regional CINCs.

Organizational Structures

USSPACECOM's evolving missions and organizations require a clear understanding of how space forces will interact among themselves and with the customers they support. Integration with associated command and control must be grounded in joint doctrine, just as land, sea, and air forces are.

Near-Term Structures

In the near term, we have two challenges. First, USSPACECOM must build a structure for command and control and an operations center (see Figure 7-14) that provides a single, multi-faceted point of contact to better serve the warfighters' space requirements (including those of USCINCSPACE). Second, USSPACECOM must continue to provide space expertise and capabilities to other warfighters until space experience is organic to all unified commands.

The first challenge is building a clear chain of command for tasking between USCINCSPACE and Component commanders, and constructing a single point of contact for warfighters. The heart of the concept is centralized planning of all space forces and decentralized execution through the Components. USCINCSPACE, through his J3, will task Components using mission-type orders.

The Space Operations Center (SPOC) will be the command center from which USCINCSPACE establishes a single point of contact for military space operations, coordinates and directs operations worldwide, commands and controls space forces, and resolves conflicts with agencies, allies, and industry. During crisis or contingency operations, USSPACECOM's battle staff and battle management cell (BMC) working through the SPOC, will

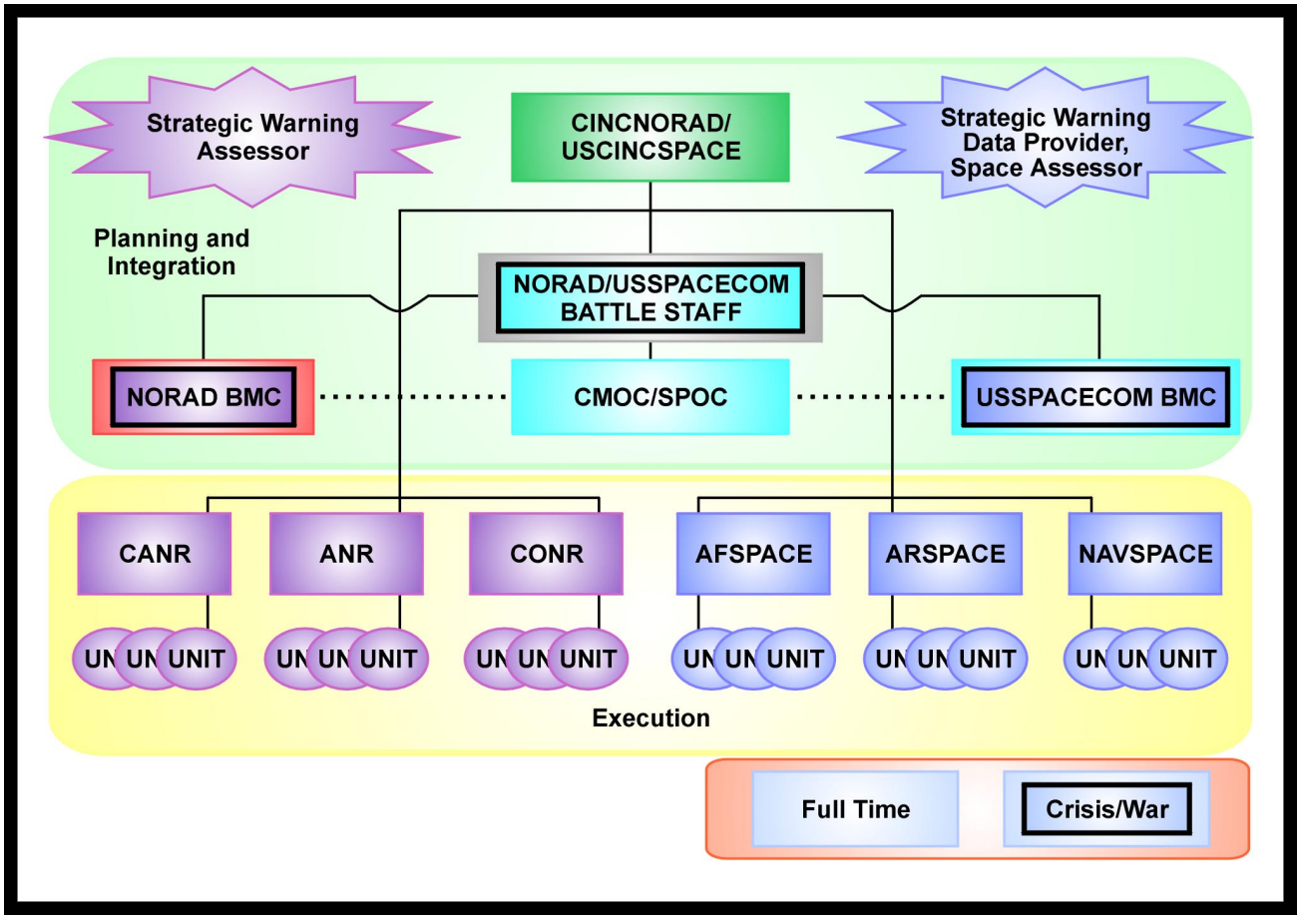

Figure 7-14 USSPACECOM's Structure for Command and Control

tailor support to CINCs. USSPACECOM will integrate and synchronize space forces to support joint and combined operations, emphasizing a joint perspective by integrating at the beginning of joint planning.

Official tasking for execution must pass from CINC to CINC unless another command relationship is established (see Figure 7-15). The normal relationship between USSPACECOM's Components and Components of other CINCs is direct liaison authority, which allows "reachback" for education, information, and initial planning. Whenever necessary, however, USCINCSPACE may expand this relationship to (1) support; (2) transfer tactical control; or (3) after consulting with the supported CINC, ask the Secretary of Defense (SECDEF) to approve transferring operational control of a specific unit.

USSPACECOM's intent is to transfer forces whenever practical so the supported CINC will have as much direct control as possible. If transferring operational control is not appropriate, we will establish the necessary command relationships. When deciding on the appropriate relationship, the Command must consider employment effects–do they stay in the region or go beyond it?–and operating location–is the system located or deployed inside the regional CINC's operating area?

Two examples, using the Joint Tactical Ground Station (JTAGS), which warns against theater missiles, will clarify this concept.

Example 1: JTAGS is permanently located in Germany, but it supports USEUCOM and USCENTCOM, and it provides shared early warning to several allied countries in both areas of responsibility. Even though it operates within one CINC's operating location, its effects are "global." Thus, USSPACECOM wouldn't transfer force or place the Component in a support relationship with the regional CINC. Rather, ARSPACE would retain operational control and have direct liaison authority with the supported CINC.

Example 2: JTAGS has deployed for a crisis in Southwest Asia. The data affects a single region. Therefore, USSPACECOM would transfer the force or place

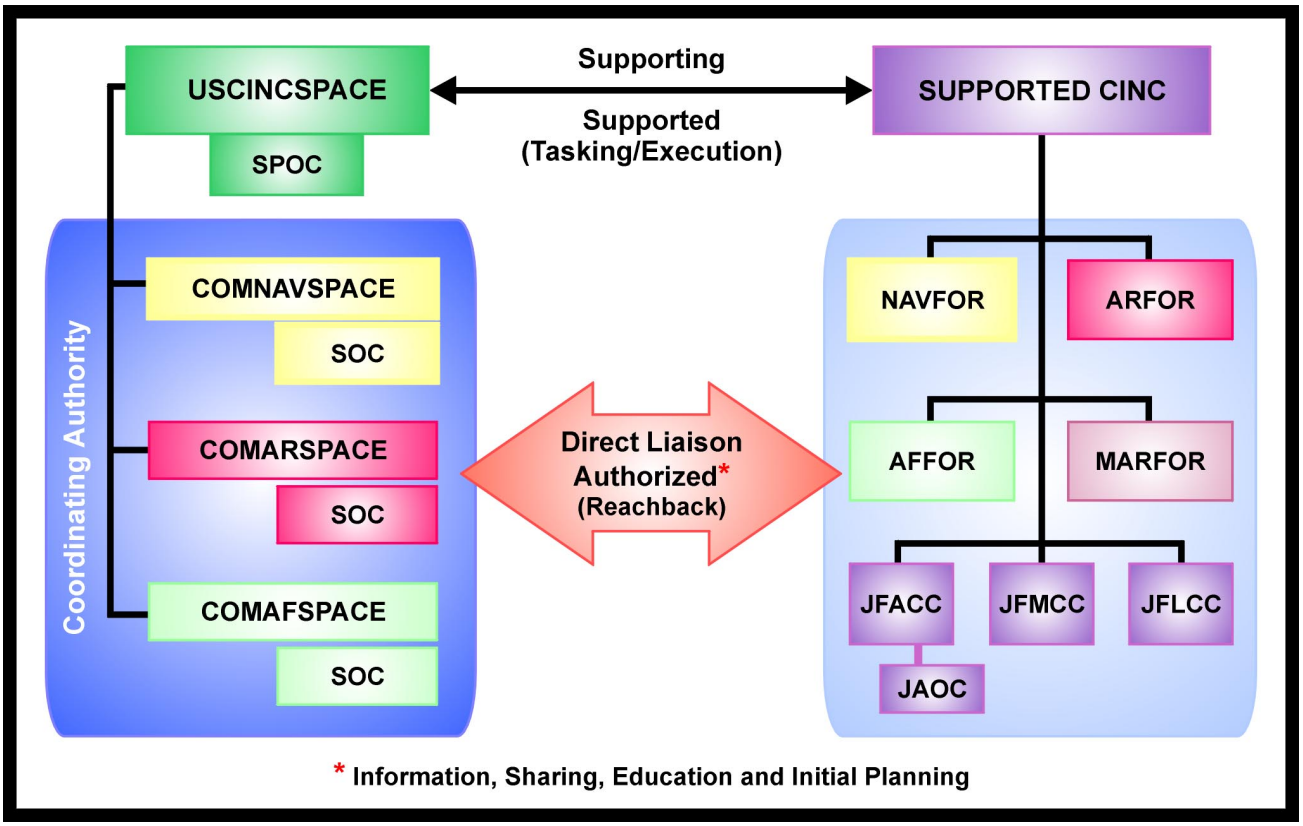

Figure 7-15 Joint Relationships

the Component in a support relationship after consulting with the regional CINC. The transfer of forces would be consistent with joint doctrine and authorized by the SECDEF.

USSPACECOM must also consider the recipient's ability to command and control the resource. If they can't, USSPACECOM may have to deploy some type of command and control element or not transfer the force. Furthermore, if the command is supporting multiple operations at the same time, we may retain direct control of the force.

Regional CINCs must resolve how to command and control space forces the SECDEF transfers to them. Joint doctrine provides the following examples (see Figure 7-16): (1) organize the space forces under a Space Component Commander; (2) integrate the space capabilities into respective service or functional components; (3) place all space forces under one of the existing Components; (4) centralize the space forces at the CINC Staff level.

The second challenge USSPACECOM faces is ensuring space expertise and capabilities are available to the other warfighting CINCs until they have enough experience to exercise command and control of space forces. USSPACECOM's Joint Space Support Teams and space liaison officers, who now augment theater CINCs, are supposed to be transition "bridges," not to remain in theaters indefinitely. USSPACECOM will give the regional CINCs enough time to grow "space-smart" people; gain confidence in their ability to request, task, and access space-derived information through their own battle managers; and establish a structure for commanding and controlling space forces before withdrawing liaison officers or support teams.

With space education and training fully in place by 2005, staffs of theater CINCs will have the required space education. At that time, command and control of space forces will be established, so regional CINCs will have a foundation for their own structures. By 2012, if not sooner, a global defense information network of sophisticated battle managers, coupled with "space-smart" staffs will replace support teams and liaison officers.

Far-term Structures

As USCINCSPACE becomes a supported CINC and begins combat operations in or from space (2008), organizational structures will evolve to support these mission changes.

Organizations within USSPACECOM (at the CINC's staff and the Components) will emerge to command, control, and carry out these new combat operations. USSPACECOM's Components will develop the necessary units (operations centers, units, squadrons, or wings) to execute Control of Space (CoS) and Global Engagement (GE) missions. The SPOC will expand its space battle manager to incorporate the oversight, commanding, and

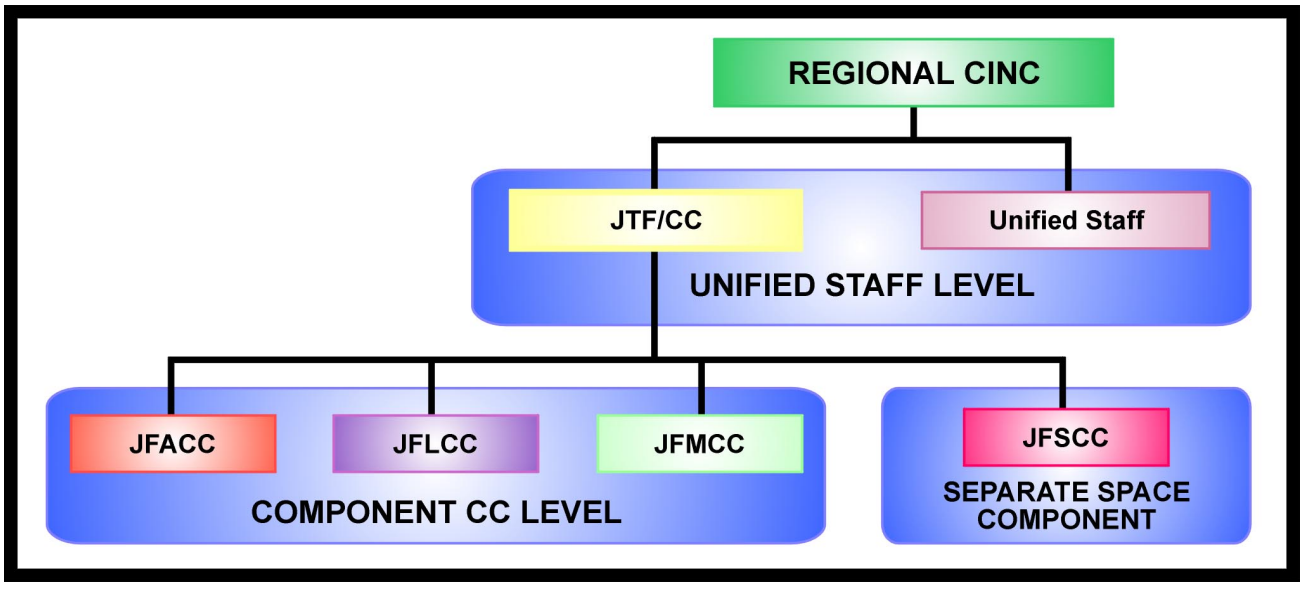

Figure 7-16 Integration Options

controlling needed to task the Components. The SPOC will also be the focal point for integrating operational partnerships as the space community merges black and white operations, masses operations with similar purposes, and collaborates on future missions. USSPACECOM's staff structure must fully support combatant requirements.

External to USSPACECOM, regional CINCs will have established their organizational structures for command and control of the space forces transferred to them.

A "traffic control" organization with worldwide coverage will need to ensure vehicles transiting to and from space are safely integrated with air traffic. This includes avoiding collisions during launch, on-orbit, and during reentry. We expect this organization to be military, civil, commercial or international. It may be a mix of all four, possibly evolving from USSPACECOM's Space Control Center and the FAA's approach to controlling air traffic. This organization for global traffic control–or global air traffic control–must be able to deconflict and protect systems and be in place no later than 2020. We'd prefer it to start operating by 2008 to meet the demand envisioned for the CoS and GE missions.

In the long run, USSPACECOM's concept for commanding and controlling space forces enhances the command's flexibility and responsiveness to support operations by the other warfighting CINCs. It provides the foundation for space to be integrated at the same level as land, sea, and air forces are today–as an integral part of the campaign, not an afterthought buried in an annex.

Organizational Partnerships

Partnering–by establishing agreements, memoranda of understanding, and procedures–is essential to critical community-wide cooperation on space issues. It will also ensure warfighters can depend on a single point of contact for military space. The military, intelligence, and civil communities for space must embrace a new paradigm in partnerships–begin with the best space support to warfighters in mind. To do so, they must integrate "black and white" space, standardize space tasking and requests, organize to better service warfighters (through the single point of contact), and design and acquire future systems that work together, support modeling and simulation, and allow rapid prototyping. Partnerships developed now will drive the success of these steps. In the next 15 years, the space community must establish agreements, memoranda of understanding, and procedures to fully support warfighters on all space operations issues. The efforts of the Ballistic Missile Defense Office and the NRO to develop agreements are great models.

Organizational Assessment

We can attain the processes, structures, and partnerships needed to improve space support to the warfighters. If communities cooperate, they can standardize and improve tasking and reporting. USSPACECOM's concept of operations for commanding and controlling space forces is laying the groundwork now for developing an expanded SPOC and for structuring components. The command's liaison officers and support teams are already in place extending support to regional CINCs until they are confident in their own space expertise. The operational relationship between USSPACECOM and the NRO is on track, and USCINCSPACE is recognized as the operational lead for integrating space forces. Continued strengthening of partnerships is integral to changing the way we operate as a space community; partnering is possible and critical to making space operational for warfighters.

Organizational Directives and Recommendations

USSPACECOM will:

- Expand the SPOC's capabilities and establish command and control policy, procedures, and doctrine for space forces to better execute missions. (SPJ3)
- Reevaluate the merit of keeping liaison officers and support teams at the regional CINCs until the latter have fully integrated training and structure for commanding and controlling space forces. (SPJ3)
- Build, distribute, test, exercise, and use daily automated requesting and tasking within the command's battle managers. (SPJ3)
- Help regional CINCs carry out their plans to command and control space forces. (SPJ3)

USSPACECOM should:

- Promote community-wide efforts to standardize requesting and tasking. (SPJ3, JROC)
- Recommend the space community close the operational gap between black and white space forces. (SPJ3, NRO)
- Encourage interoperability, models and simulations, and rapid prototyping of future space systems. (SPJ5, OSD)
- Encourage partnerships with agreements, memoranda of understanding, and procedures to better support warfighters. (SPJ3, OSD)
- Recommend regional CINCs determine how to do planning and tasking for space capabilities not under their direct control and how to command and control space forces transferred to them. (SPJ3, Regional CINC's J3)

SUMMARY ASSESSMENT

We consider all four objectives–policy and doctrine, education of people, information, and organization–**achievable**.

Full Force Integration–Critical Thrusts

Integrating space forces and space-derived information with land, sea, and air forces and their information is critical if our nation is to remain the world's preeminent fighting force. Warfighters today face formidable tasks from peacekeeping operations to full-scale conflict. Budget and staff reductions make these challenges even more daunting, but we can meet them if we integrate all mediums to give warfighters every possible advantage. Space is a key player in this integration which faces seven critical issues:

- **Education and training**. To exploit space, we must have all warfighters educated and trained on space capabilities. People must make decisions on the battlefield and in the program office based on a complete understanding of these capabilities.
- **Policy and doctrine**. Although space today is a key resource to warfighting commanders, it is still very much in its infancy. To realize the full potential of space and to address the complex issues that will continue to arise, warfighters must have clearly defined policy and doctrine. We must write this space policy and doctrine correctly to ensure future economic prosperity and national security.
- **Exercises**. Warfighting forces must consistently train in realistic environments to maintain their highest levels of readiness and effectiveness. Meaningful space events must be an integral part of major exercises to increase the warfighters' proficiency and understanding of what space brings to the "fight."
- **Battle managers**. Battle managers will reduce the warfighter's planning time, fuse information from all sources, increase situational awareness, reduce decision time, and ultimately lead to information superiority. Battle managers must incorporate:
  - Information fusion
  - Situational awareness
  - Timely assessment and reporting
  - Course of action development
  - Assured access to information
  - Tasking of resources
  - Multi-level security
  - Modeling and simulation of space forces capabilities
  - Interoperability
- **Modeling and simulation of space capabilities**. Modeling and simulation is the most powerful, and often the only way to represent space in exercises and wargames. Warfighters must require that all space-based systems the Services develop also have accurate modeling and simulation capabilities. Declining dollars for defense mean we must carefully analyze trades for space–sophisticated models will make this possible.

- **Command and control of space forces**. Space is clearly the high ground warfighters will need to prevail. To secure that edge, we must have a clear chain of command between USCINCSPACE, the Components, and the other warfighting CINCs, so they can centralize planning and tasking but decentralize execution (locally). At the same time, as the nation's military reduces in size and mass, DoD must leverage other advantages to ensure it can carry out the tasks it will be asked to do by our nation.

- **Adopting or creating global standards**. Interoperability and the integration of information are critical to furnishing warfighters the knowledge they need to dominate the battlespace. Global standards are key to these capabilities.